

CLAIMS

1. A refrigeration system in which compressing and heat-releasing of a refrigerant by a compressor and a heat-releasing device are performed in turn repeatedly in a multistage manner to
5 obtain a low-temperature and high-pressure refrigerant, wherein the low-temperature and high-pressure refrigerant is decompressed by a decompressing device, then passes through a cooler to absorb heat from a medium to be cooled and then returns to the compressor.
- 10 2. The refrigeration system as recited in claim 1, wherein the refrigerant is carbon dioxide (CO₂).
3. A refrigeration system, comprising:
a primary compressing portion that primarily compresses a
15 refrigerant;
a secondary compressing portion that secondarily compresses the refrigerant;
a primary heat-releasing portion that primarily performs heat-releasing of the refrigerant;
20 a secondary heat-releasing portion that secondarily performs heat-releasing of the refrigerant;
a decompressing device that decompresses the refrigerant; and
a cooling device that cools a medium to be cooled by absorbing heat from the medium,
25 wherein the refrigerant primarily compressed by the primary

compressing portion is primarily released in heat by the primary heat-releasing portion, the primarily heat-released refrigerant is secondarily compressed by the secondary compressing portion, the secondarily compressed refrigerant is secondarily released in heat by the secondary heat-releasing portion and then passes through the cooling device to absorb heat from the medium, and then returns to the primary compressing portion.

4. The refrigeration system as recited in claim 3, wherein the refrigeration system is provided with a multistage type compressing device, wherein a first-stage compressing portion of the multistage compressing device constitutes the primary compressing portion, and a second-stage compressing portion of the multistage compressing device constitutes the secondary compressing portion.

5. The refrigeration system as recited in claim 3, wherein the refrigeration system is provided with a heat-releasing device, wherein a heat-releasing portion of the heat-releasing device is divided into two divisional heat-releasing portions, wherein one of the divisional heat-releasing portions constitutes the primary heat-releasing portion and the other thereof constitutes the secondary heat-releasing portion.

6. The refrigeration system as recited in claim 5, wherein

a volume rate of the primary heat-releasing portion with respect to an entire volume of the heat-releasing portion of the heat-releasing device is set to be 0.2 to 0.5.

5 7. The refrigeration system as recited in claim 3, wherein a compression ratio of the refrigerant by the secondary compressing portion with respect to a compression ratio of the refrigerant by the primary compressing portion is set to be 0.5 to 1.5.

10 8. The refrigeration system as recited in claim 3, further comprising an intermediate heat exchanger for subcooling the refrigerant secondarily released in heat by the secondary heat-releasing portion by exchanging heat with a return traveling refrigerant flowing out of the cooling device.

15 9. The refrigeration system as recited in claim 3, wherein carbon dioxide (CO₂) is used as the refrigerant.

20 10. A compressing and heat-releasing apparatus equipped with a multistage compressor, wherein a refrigerant is primarily compressed by a first-stage compressing portion of the multistage compressor, the primarily compressed refrigerant is primarily released in heat by a primary heat-releasing portion, the primarily heat-released refrigerant is secondarily compressed by a
25 second-stage compressing portion of the multistage compressor, the

secondarily compressed refrigerant is secondarily released in heat by a secondary heat-releasing portion, to thereby obtain a low-temperature and high-pressure refrigerant.

5 11. The compressing and heat-releasing apparatus as recited in claim 10, wherein the compressing and heat-releasing apparatus is provided with a heat-releasing device, wherein a heat-releasing portion of the heat-releasing device is divided into two divisional heat-releasing portions, wherein one of the divisional heat-releasing portions constitutes the primary heat-releasing portion
10 and the other thereof constitutes the secondary heat-releasing portion.

 12. The compressing and heat-releasing apparatus as recited
15 in claim 11, wherein a volume rate of the primary heat-releasing portion with respect to an entire volume of the heat-releasing portion of the heat-releasing device is set to be 0.2 to 0.5.

 13. The compressing and heat-releasing apparatus as recited
20 in any one of claims 10 to 12, wherein a compression ratio of the refrigerant by the secondary compressing portion with respect to a compression ratio of the refrigerant by the primary compressing portion is set to be 0.5 to 1.5.

25 14. The compressing and heat-releasing apparatus as recited

in claim 10, wherein carbon dioxide (CO₂) is used as the refrigerant.

15. A heat-releasing device provided with a primary heat-releasing portion for primarily releasing heat of a primarily compressed refrigerant and a secondary heat-releasing portion for secondary releasing heat of a secondarily compressed refrigerant after being primarily released in heat, the heat-releasing device comprising:

a pair of headers; and

a plurality of heat exchanging tubes disposed between the pair of headers arranged in parallel with each other in a longitudinal direction of the header with opposite ends thereof being connected to the headers;

wherein a refrigerant passing through the plurality of heat exchanging tubes exchanges heat with cooling air introduced from a front side of the heat-releasing device and passing through a gap between adjacent heat exchanging tubes to be released in heat,

wherein each of the headers is divided by a partitioning member at a same height position to thereby classify the plurality of heat exchanging tubes into upper and lower heat exchanging tube groups, one of the heat exchanging tube group constituting the primary heat-releasing portion and the other thereof constituting the secondary heat-releasing portion.

16. The heat-releasing device as recited in claim 15,

wherein the lower heat exchanging tube group constitutes the primary heat-releasing portion and the upper heat exchanging tube group constitutes the secondary heat-releasing portion.

5 17. The heat-releasing device as recited in claim 15, wherein an inner volume rate of the heat exchanging tubes constituting the primary heat-releasing portion with respect to an entire inner volume of the plurality of heat exchanging tubes is set to be 0.2 to 0.5.

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18. The heat-releasing device as recited in claim 15, wherein carbon dioxide (CO₂) is used as the refrigerant.

15 19. A heat-releasing device provided with a primary heat-releasing portion for primarily releasing heat of a primarily compressed refrigerant and a secondary heat-releasing portion for secondarily releasing heat of a secondarily compressed refrigerant after being primarily released in heat, the heat-releasing device comprising:

20 a pair of headers; and

a plurality of heat exchanging tubes disposed between the pair of headers arranged in parallel with each other in a longitudinal direction of the header with opposite ends thereof being connected to the headers;

25 wherein a refrigerant passing through the plurality of heat

exchanging tubes exchanges heat with cooling air introduced from a front side of the heat-releasing device and passing through a gap between adjacent heat exchanging tubes to be released in heat,

wherein each of the heat exchanging tubes is provided with
5 a plurality of refrigerant passages arranged in a tube widthwise direction,

wherein each of the pair of headers is divided by a partitioning member extending in a longitudinal direction of the header into a front space and a rear space, whereby the plurality
10 of refrigerant passages of each heat exchanging tube is classified into a front refrigerant passage group and a rear refrigerant passage group, one of the refrigerant passage groups constituting the primary heat-releasing portion and the other thereof constituting the secondary heat-releasing portion.

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20. The heat-releasing device as recited in claim 19, wherein the rear refrigerant passage group constitutes the primary heat-releasing portion and the front refrigerant passage group constitutes the secondary heat-releasing portion.

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21. The heat-releasing device as recited in claim 19, wherein an inner volume rate of the heat exchanging tubes constituting the primary heat-releasing portion with respect to an entire inner volume of the plurality of heat exchanging tubes is set to be 0.2
25 to 0.5.

22. The heat-releasing device as recited in claim 19, wherein carbon dioxide (CO₂) is used as the refrigerant.